SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

No. 3119.—Vol. LXV. LONDON, SATURDAY, JUNE 1, 1895. PRICE (WITH THE JOURNAL) SIXPENCE. BY POST, £1 4s. PER ANNUM.

CERTAIN DISSIMILAR OCCURRENCES OF GOLD-BEARING QUARTZ.*

By T. A. RICKARD.

Coincidence of the Pitch of an Ore Chute with the Intersection of Lode and Country.

No feature of vein mining offers more perplexing problems than the uncertain behaviour of ore chutes. Occasionally the evidence obtained from underground surveys indicates the pitch in a particular direction of the successive ore bodies of a particular mine; but the deductions which are then made may prove as dangerous and delusive as they often are practically useful.

In a little mine among the Australian Alps there was afforded me a very striking illustration of the dependence of ore deposition upon the geological structure of the country rock. At the Shouldn't Wonder Mine, seven miles from Bright, Victoria, the country rock is of Upper Silurian age, and consists of altered slate and sandstones having a varying dip to the south-west, and a strike 35° to 50° west of north. Though these rocks show the changes due to metamorphic action, and exhibit a well-developed cleavage, yet the bedding has not been obliterated. The lode of the mine is a quartz vein, having a strike 28° west of north, and a dip to the north-east of 75° to 78°. The width of the lode is 15 to 24 inches, and consists of simple gold quartz, containing a very small but varying percentage of pyrite. Occasional faults occur, which are called "heads" by the miners, and have a throw to the left. The break which they cause is clean, and there is no difficulty in again picking up the lode beyond the fault.

The plane of the lode cuts across the bedding of the country rock, and the vein is, therefore, what is commonly called a "true fissure." The examination of the footwall shows that the bedding planes are marked by lines having a dip 42° south. While the footwall is more regular than the hanging, and indicates this feature best, yet the face of the latter carries lines which correspond to those occurring in the opposite wall.

The sketch (on Plate I) will illustrate the face of the footwall. A A, B B, and C C are the bedding planes. A small quartz seam follows the parting at C C, while D D is a minute cross vein traversing the country independently of its stratification.

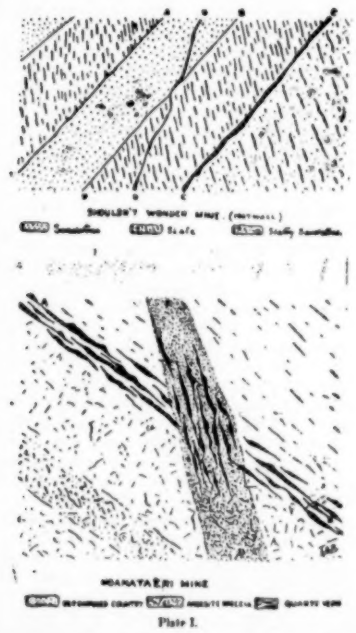

Plate I.

The country has a dip 79° south-west, and a strike 55° west of north. The line of intersection formed by the crossing of the planes of stratification and the lode fissure was found to make an angle of 46° south, as indicated by the footwall. Upon referring to the longitudinal section of the underground workings it was found that this angle coincided with the pitch of the ore bodies, as worked in the four successive levels of the mine.

At the Myrtle Mine, a few miles further south, there was the same correlation between the pitch of the ore bodies and the line of intersection of the wall of the lode with the bedding planes of the enclosing country. The stratification was distinct, the rocks consisting of altered, often very silicious, slates of a grey to grey-blue colour. At the 700 foot level the country had a dip of 80° south-west, and a strike 46° west of north, while the vein dipped 80° north-east, and had a strike of 20° west of north. The quartz vein was 2½ to 3 feet wide. In the stopes above this level the pay ore was separated from the valueless quartz by a small step, due to the irregular fracture of two beds of slate of unequal hardness. The miners had considered this a small fault; it marked the line of intersection between lode plane and country bedding.

This particular ore chute was 85 feet long, and of variable gold contents. The quartz contained a large proportion of included fragments of country rock, giving the ore a mottled appearance. The gold was fine, often forming a gilded mosaic upon the faces of fractures.

In the different parts of the mine the changing dip of the country produced variations in the angle of the lines of intersection, which varied from 35° to 55° south. The general pitch of the ore bodies of the mine, as worked to a depth of 700 feet, was found to be 45° south.

The Occurrence of Ore at the Intersection of Bands of Decomposed Country Rock.

I must now ask you to leave Australia and go to the north island of New Zealand. The gold mining district of Hauraki—also known as the Thames—offers many interesting studies in ore deposition. The country rock of the mines is an andesite breccia.* It shows a certain rude stratification, and is characterised by the occurrence in it of bands of decomposed rock—often termed "sandstone" by the miners—in which it is difficult to recognise the true character. In many ways the lode formation and mineral occurrence of this district resemble that of the gold fields of Transylvania (Hungary).

At the Moanataeri Mine, at the 200 feet level, I obtained the sketch given on Plate I. The structure of the country rock is indicated. A B consists of a series of small quartz seams, called "leaders," overlaid by hard, reddish-brown andesite, and underlaid by a similar rock whose brecciated structure is more evident, C D is a band of soft, gray, decomposed rock which cuts across the structural lines of the country and contains a number of veins of quartz, but only near its crossing with A B. The line of C D is parallel to that of a main fault seen in other workings. The leaders in the band A B are gold-bearing, particularly near their intersection with C D.

In the main adit, 108 feet deeper, the lode known as "No. 9 Reef," presents the appearance shown in the upper drawing on Plate II. This is taken in horizontal section as seen along the roof of the tunnel. A band (D D) 13 inches to 2 feet wide, of granular, grey rock, traverses a dark reddish-brown andesite whose brecciated character is more evident on one side (A A) than on the other (C C). In this grey band (D D) which constitutes the lode there are dark seams of flinty quartz, accompanied by frequent cavities or vughs. In the encasing country there are numerous veins of zeolites.

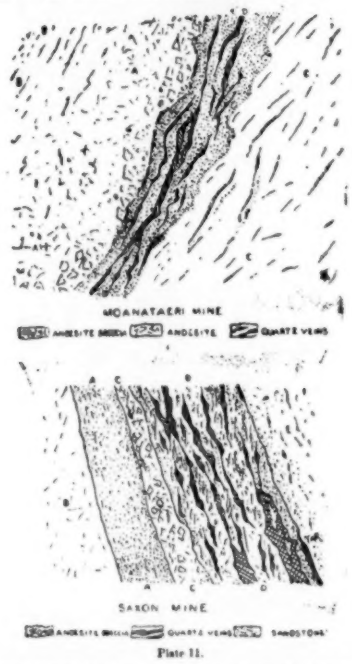

Plate II.

The mine workings disclose a series of such bands of decomposed country seamed with quartz streaks varying in width from that of a sheet of paper up to 3 or 4 feet. The gold is particularly patchy in occurrence, and is found in the form of filaments and threads of minute size distributed through a matrix of very hard, dark quartz, especially when the latter is cavernous.

At the Saxon Mine, the main lode has a better definition, and a more regular course than is usual in this district. Its width varies from 8 to 9 inches to 3 or 4 feet. The cross section, given on Plate II, shows a certain laminated arrangement. B is the ordinary andesite country rock. A A is a white to yellow-white granular tufaceous material called "sandstone." It consists of much decomposed andesite. C C is the "motley" of the miners. It consists of andesite, altered, much brecciated and mineralised. A is altered andesite, with zeolite veins. D D is the main streak of pay ore, and consists of small veins of white cavernous quartz arranged in a general matrix of white sugary material.

At another mine, the Waiotahi, we have another illustration of the vein structure. (See Plate III.) Here C is the ordinary country rock. B B is the band of the same, but much decomposed, and altered to a grey, granular material. A A is the "main reef," consisting of a vein of quartz 5 to 8 inches wide, characterised by cavities distributed along its centre. D is also andesite breccia, which is traversed by a series of small quartz seams (E E), the largest of which are nearly at right angles to the "main reef." The formation resembles a "stockwerk," since the whole mass of country adjoining the regular vein (A A) is streaked with quartz seams sufficiently auriferous to make it profitable to mine them.

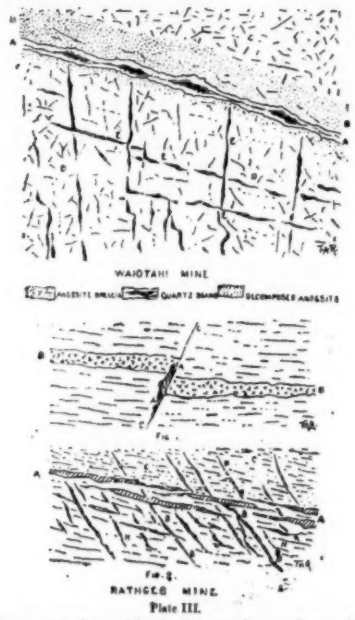

Plate III.

In general, it may be said of the main reefs or lodes of this district that they have a course similar to that of the mineralised belts of which they form a part. These belts are bands of soft decomposed country having a variable width and hardness. The harder portions cannot be said to be non-auriferous, but as they are more costly to mine, they are left to one side. Where portions of hard, less altered country meet the softer lode formation, it is not unusual to find that the quartz reefs deviate from their straight course and go around, rather than through, the hard bar of country rock.

My investigations into the geology of the district were insufficient to permit of an attempt at any detailed description. But the evidence obtainable in the mines, and the examination of natural sections along the sea shore, and in the gullies of the neighbouring hills indicated that the prevailing country rock of the auriferous area was an andesite breccia, and that it has been laid down in water. It has a certain rude stratification, and is overlaid by mudstones and slates. It seems probable that the breccia formation owes its existence to the fragmentary eruption of masses of andesite, which, falling into a shallow body of water, such as an estuary, became subsequently consolidated. The bands of "sandstone" and "felsite" found in the mines are probably volcanic tuff and ash, which have also been deposited under water. The occurrence of overlying mudstones and slates is confirmatory of this supposition. The later formation of the lodes of the region appears to be due to the effects of lingering igneous agencies. The belts of decomposed country, the character of the country rock, the strongly mineralised underground waters, the behaviour of the quartz seams, and the neighbourhood of an active volcanic region (at Rotomahana and Tarawera, further south) all suggest the origin of the lodes as due to the work of solfataric agencies.

This gold field, though now no longer of any considerable importance, must yet be ranked among the most extraordinary discoveries of the century. The ore is often of very remarkable richness. At the Moanataeri, in 1878, 5400 pounds of quartz produced 14,600 ounces of gold, being at the rate of over 2¾ ounces per pound of ore. In the year 1871 the Caledonia Mine paid three million dollars (£600,000) in dividends, producing 10 tons of gold in 11 months. These figures speak for themselves. Later exploration has proved that the ore does not continue so rich in depth as it was nearer the surface, and that the horizonal development of the mines is more profitable than the extension of the workings in depth.

Occurrence of a Rich Pocket of Gold Ore at the Crossing of a Fault Plane.

The "pockets," or extremely rich patches of gold-bearing quartz, which are found in certain lodes of the main Californian gold belt, more particularly in Calaveras and Tuolumne counties, offer many points of interest. The gold is often intermixed with so little quartz as to resemble a nugget; differing, of course, from the latter in the absence of water-worn edges, and by its more filiform spongy structure. It was long supposed that no gold had been found in the quartz reefs in pieces such as would explain the derivation of the larger nuggets by the degradation of pre-existing quartz lodes. In these "pocket" mines, nevertheless, there have been found occurrences of gold quite able to account for the largest nuggets which have yet been found in California. It must not be understood, however, that in making this statement of fact I would wish to uphold the origin of nuggets as due to purely mechanical agencies.

At the Rathgeb mine, near San Andreas, there was found one of these "pockets." It may be premised that the main lode of this mine has an augite schist (a very beautiful rock in which the augite is porphyritically disseminated) on the footwall, and a more compact and massive rock, approaching a diabase, on the hanging.

The zone of oxidation has a depth of about 160 feet; below this the lode is large and poor, consisting of white, massive

* Reprint from the Report of the Colorado Scientific Society.

* Much resembling the enormous masses of andesite breccia characterising the geology of certain districts in the south-western mining regions of Colorado.

quartz; but above the water level the vein is replaced by a network of quartz seams of varying sizes. Those having a regular strike to the north-west represent the main lode, while the smaller, more irregular cross-veins may be considered as "feeders." (See Fig. 2 on Plate III.) Where these veins intersect there have been found bunches of rich quartz containing gold in a coarse form. I will describe the mode of occurrence of the richest pocket which was found during my stay at the mine.

At the 120 feet level (south) and about 150 feet from the shaft there were some old workings, and upon an examination of these, there was noticed a small cross-vein 1-16th of an inch thick, the red clay filling of which showed a great deal of free, fine gold when washed in a pan. A miner, experienced in "pocket hunting," was put to work at this place. The small streak, while it was generally very "slim" in size, yet occasionally opened out to small lenticular openings, yielding a clay in which the gold was as raisins in a pudding, though also mixed with quartz, some adhering, some merely fragmentary. Each pocket yielded gold worth from $100 to $500. At length this cross vein widened to 6 or 8 inches, and looked like an ordinary richness, but not up to "pocket" standard. The amount of red clay began to increase, it became daily more gold-bearing, and a rich discovery was hourly expected. It was duly found. The vein became faulted, and at the place of the fault there was a soft, spongy, wiry mass of gold and clay—more gold than clay. The first handful which I broke while yet the stope was obscure with powder smoke contained 3 ounces of gold. Within the next two hours that pocket gave us $3000 worth of gold, and in the days that followed it yielded over £20,000, obtained at an expense of less than $200. When it had been worked out it was easy to study its mode of occurrence. The sketch given in Fig. 1, Plate III., will explain. The vein had been faulted about its own width—namely, 10 inches, and along the recess so formed the nest of golden material was found. A few feet overhead the vein met with another cross-vein which bounded its extent in that direction, while below it narrowed to the width of a knife-blade.

The gold was spongy and accompanied by a certain amount of quartz which filled the interspaces. The clay which covered the gold and quartz was partly red, ochreous material and partly a gray gelatinous, silicious matter. The gold, when washed, sold for $18 per ounce. The quartz associated with it carried pitchblende (uraninite) in needle-shaped crystals, which, immediately adjacent to the gold, became yellow uranium ochre. The association of gold and uranium is uncommon.

Organic Matter as a Precipitant of Gold.

Leaving California, let us return to the southern hemisphere. In the colonies one often hears of the "Indicator" of the Ballarat mines. In the underground workings of the New Normanby, I had an opportunity of examining it. The country rock is Lower Silurian, as proved by the graptolites, and consists of slightly metamorphosed slates and sandstones, thinly bedded and having an easily recognised stratification. The strike is nearly due north, while the dip is almost vertical and to the east. The "Indicator" conforms to the bedding, and consists of a thin seam of black slate. It has become a very notable feature of the mines of Ballarat East, because its crossing of other veins is frequently coincident with the occurrence of gold-bearing quartz of great richness.

At the 700 feet level of the New Normanby Mine, the breast of the drift appeared as shown on Plate IV. The thick black line is the "Indicator." It deviates from the vertical 5 feet in 100 feet, and separates a sandstone from a slaty rock. The adjoining country is "ribboned"—that is, it consists of closely alternating thin beds of slate and sandstone of varying shades of colour. Both country rock and "Indicator" are disturbed and slightly dislocated by the crossing of certain flat veins, or spurs of quartz. Near the crossing, these veins are highly auriferous, and consist of very white, brittle quartz, carrying free coarse gold.

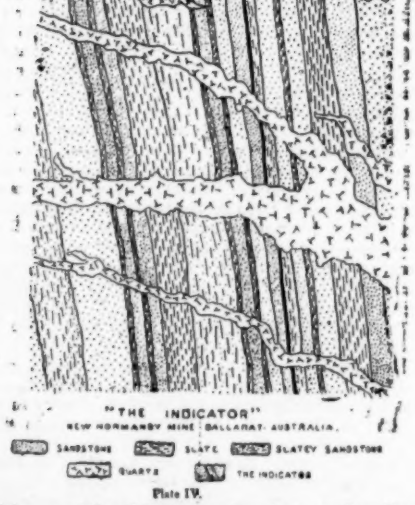

Plate IV.

The thickness of the "Indicator" varies; so does its composition. In the above-mentioned drift it is about 1-16 inch, and carries pyrite and crushed black slaty material. In the crosscut, at the same level, it contains a small seam of quartz. In an adjoining mine—the Prince Regent—it is ¼ inch thick, and carries pyrite and black clay. When the black clay, or black slate, is replaced by quartz, the occurrence of rich ore has been found by experience to be less probable. At the surface this part of the Ballarat district was extremely productive. Between the New Normanby and the next mine to the north—the North Woah Hawp—the line of the "Indicator" is crossed by an alluvial lead, known as the Canadian, and near the crossing there were found a large number of the nuggets which made Ballarat so famous early in the "fifties."

The "Indicator" may be considered as a bedded vein, in that it follows the stratification. An enquiry into the reasons which render its near neighbourhood so favourable to the occurrence of highly gold-bearing ore would offer much matter for interesting discussion. It is probable that this thin seam of black slate, of which the "Indicator" consists, represents a layer of fine silt, full of the remants of vegetable life which was laid down upon the floor of the Silurian sea. The organic matter so derived afforded a reducing agent for the precipitation of the gold from mineral solutions circulating through the fissures and fractures which traversed this particular part of the district.

In presenting the foregoing brief notes, descriptive of certain ore occurrences in the gold-bearing veins of mining districts so widely separated, the writer has not aimed so much to call attention to any new economic features in this special class of ore deposits, as to afford evidence of the fact of the great variety of the modes of occurrence of gold-bearing quartz, and to emphasise the consequent danger of attempting to take a theory applicable to one district, and apply it to another region far distant and of entirely dissimilar geological structure.

DISCUSSION.

Mr. PHILIP ARGALL: The coincidence of the pitch of an ore chute with the line of intersection of the planes of stratification of the country rock and lode fissure, appears to me to be an undoubted proof of the favourable influence of certain zones of country rock on the deposition of ore in veins. Probably no phenomena of vein formation have been more carefully noted, or more often described than this "influence of the country rock on the deposition of ores in veins." It may, however, be permissible to quote briefly some authorities bearing directly upon the subject. Müller, describing the Freiberg ore deposits,* states:—"The lodes in general, without distinction in regard to the character of the formation, have attained a development favourable to mining only within compact rocks, in which feldspar or quartz, hornblende, pyroxene, as also carbon (graphite, anthracite), form an essential ingredient." W. J. Henwood, in describing the metalliferous deposits of Cornwall,† states:—"The lodes are closely related to the rocks immediately adjoining them. Their structure, like that of the rocks, seems in some measure dependent on their mineral characters. . . . Most bodies (courses), as well of tin as of copper, have within their respective lodes an endlong dip or chute, which usually approximates to the contour and bedding of the neighbouring granite, and to the inclination of the cleavage-planes in the adjacent slates. In each of our several mining districts, the lodes are productive on similar lines taken at right angles to their respective directions, hence the phrase, 'ore against ore.' But, as the direction of the lodes varies in different districts, the direction of these productive lines is not always the same." Professor Moissenet, in his extremely valuable publication,‡ also gives this matter a careful analysis, terming the coincidences observed by him the "influence of parallelism, or *vis-à-vis* of riches in lodes nearly parallel." J. H. Collins, in describing the lodes of Cornwall,§ states:—"That some lodes have copper ore only in slate, and tin ore only in granite, and at the Botallack Mine one of the lodes was found to pass three times from granite to slate, or the reverse, containing none but tin ore in the granite, and none but copper ore in the slate. The classic example of the influence of the country rock on the deposition of ore in veins is found at the famous Kongsberg Mine, in Norway, discovered in 1623, and worked almost uninterruptedly since. The silver mines are found most productive in certain belts of rock called fahlbands, which are irregular in their dimensions; the greatest thickness recorded being 1000 feet. They are parallel in strike and inclination with the gneissoid and schistose strata in which they occur, and are subject to the same local disturbance of stratification. These fahlbands are traversed by fissure veins containing silver ores, and long experience has shown that these veins are productive only where they intersect the fahlbands. The example given by Mr. Rickard is interesting, inasmuch as it shows that at least one of the observed laws relating to the deposition of ore in veins in the northern hemisphere has a further confirmation from the antipodes. It also furnishes an excellent illustration that the aphorism, "ore against ore," is only true when the dip and strike of the favourable beds are taken into favourable account. To make this clear, I show in plan,

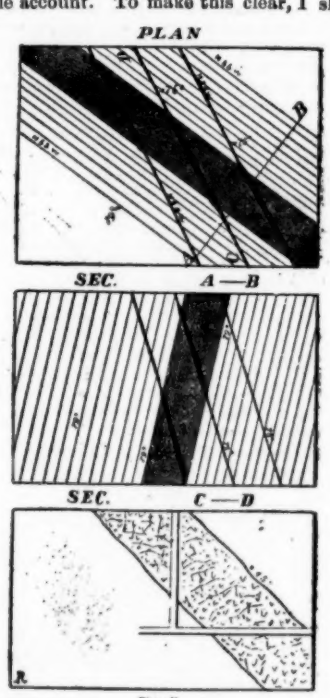

Plate V

Plate V., a series of slate beds and mineral veins having the direction of those indicated by Mr. Rickard as occurring at the Shouldn't Wonder Mine, but I have marked in fine lines one particular bed, which we will assume to be a favourable zone for the deposition of ore in the veins; the ore-chutes will, therefore, be limited to this particular zone in which I have shown them as enlargements of the veins. Now, it will be seen from the plan and section A-B that, if a crossent is projected from an ore-chute on one vein, on the theory of "ore against ore," it will reach the objective vein in an unproductive place. The section C-D shows the dip of the ore-chute in the vein, as indicated by Mr. Rickard. This dip of 45° southerly is that of the line of intersection of the lode and the favourable zone of country rock. I have seen many cases of "ore against ore" in parallel veins in eruptives, an example being the Kapanga Mine, New Zealand. Here, two parallel veins have the same dip (33°) and are separated by 80 feet of tufa. The ore-chute in the Kapanga vein was found to fairly correspond with that in the parallel Scotty's vein, and what is more curious, the rich ore in both chutes ceases to exist at about the same depth from surface, thus, as it were, proving the correctness of the theory ("ore against ore") in both directions. I could not detect any change in the country rock along the course of the veins; the same rock formed the walls of the ore-chutes, and also of the walls of the unproductive part of the veins. The Gympie reefing fields, in Queensland, described by Jonathan C. B. P. Searer‖ are remarkable for the fact that the lodes depend upon the character of different bands of rock they pass through for the extent to which they are auriferous. Bands of black slate occur with diorite and other rocks, and it is in the black slate that the lodes contain most gold, being comparatively poor in other parts. Four bands of this black slate are known to exist, and so dependent are the reefs on it that the miners first sink to cut the slate, then drive to where a reef passes through it and start to work the lode at that place. While not able to discern many features in common between the lode formation of the Hauraki district of New Zealand and that of Transylvania (as described in the books), I recognise in the section of the Waiotahi Mine a typical illustration of the veins of the Hauraki district. The reef A A is particularly good; the band B B is often in the nature of a gouge containing quartz fragments (auriferous when near a pocket) embedded in a soft, unctuous clay. The quartz seams E E are, however, not very common, and I have seldom seen them rich enough to pay for treatment. I regret very much that Mr. Rickard has not called attention to the minerals associated with the gold in the reefs of the Hauraki district, particularly to arsenic, both in the native state and as arsenical pyrites; also to the tellurides. Had he done so, we might have learned something new regarding the occurrence of those associated minerals. In the Coromandel Mines the gold is extremely bunchy, the vein quartz seldom pays to crush unless free gold is visible, and when it is visible, the picked stone is usually estimated at ounces of gold per pound of quartz, instead of per ton; the two and one-half ounce per pound returns given in Mr. Rickard's paper are not at all unusual. I myself have seen many lots of picked quartz that ran from three to five ounces of gold per pound, and small lots that contained seven ounces. So coarse is this gold that the mill-dirt from rich pockets will seldom run over two ounces per ton of rock, showing how easy it is to pick out the gold by hand. The veins are perhaps best described as specimen veins. Native arsenic occurs very frequently associated with rich gold-quartz in the Coromandel district, and arsenical pyrites is very abundant. Green chloritic minerals are also common in association with the richest gold pockets, particularly when the pocket is near a veinlet, dropping in from the hanging-wall. Arsenic in one form or another is concomitant with gold in all the deposits I have any knowledge of, and where arsenical and iron pyrites occur in a gold vein, the former is invariably richer in the precious metal. Sometimes the arsenic minerals in gold veins are not at all apparent, as for example, in the Gilpin county ores. In this connection Mr. Richard Pearce, of Argo, states:*—"In an almost daily examination of these ores for 18 years, I have never seen but one small characteristic specimen of arsenio-pyrite; nevertheless, in roasting Gilpin county ores an appreciable amount of arsenic is always found, so that arsenic may be said to be present in these ores in some form which does not make itself manifest as belonging to any mineralogical species, but rather as an accessory impurity." Chlorite and chloritic schists are also closely associated with rich gold deposits, as, for instance, at the El Callao Mine, in Venezuela. Telluride minerals are also found in most gold veins. It is an undoubted fact that organic matter may act as a precipitant of gold, from its mineral solution. The example given by Mr. Rickard in the "Indicator" is as instructive as it is interesting. I would particularly call attention to the enrichment of the quartz in the neighbourhood of the graphitic clay seam, which is, I believe, rather unusual outside of Victoria. The series of lodes in California called by courtesy the "mother lode," do not, I believe, show any enrichment in the slates; they are, in fact, equally as rich and as poor in slates, in diorite or in serpentine. It has been observed, however, that in slate the lode is almost entirely composed of quartz, while in serpentine a considerable amount of gangue is invariably included in the vein.† Professor Silliman has found tellurides of gold and silver abundant in some portions of the mother lode, while he gives the name "mariposite" to a green, scaly mineral, which is very characteristic of the lode. Ribbon quartz—that is, quartz having alternating streaks of quartz and a dark-coloured mineral, is usually richer in gold than the ordinary vein quartz. This dark-coloured mineral is itself rich in gold, and is of varying composition. It may be a thin film of slate; very often it is graphitic material, while, according to J. A. Philips, it is, in the California quartz veins, sometimes roscoelite—a micaceous mineral containing over 28 per cent. vanadium oxide. Black graphitic shale is sometimes, however, unfavourable to the enrichment of mineral veins, an example being the cupreous iron-pyrites lodes of Wicklow, Ireland, where the lodes are very bunchy and unusually unproductive in the "coal ground" of the miners. I have very often found pyrites in spheroidal forms in this graphitic shale, and occasionally native copper in the laminæ.‡ In this connection I made some experiments with the mine water (which held copper and iron sulphates in solution), looking towards the reduction of the copper by the shale. My experiments, however, were only successful when the pieces of shale were immersed in the mine waters in contact with pieces of metallic iron. Under these conditions I secured a beautiful deposit of metallic copper on the shale, due, no doubt, to the galvanic current generated.

Mr. T. A. RICKARD: In the course of his very interesting contribution to the discussion, Mr. Argall made reference to the mother lode of California, and he quoted a remark made by a writer (Mr. H. W. Fairbanks) in the tenth annual report of the State Mineralogist. I do not know upon what facts is based the statement that the veins of that region are equally rich whether they traverse slate, diorite or serpentine; but a two years' acquaintance with the lode structure of the best developed portion of the gold belt—the counties of Amador and Calaveras—induces me to offer the following observations:—There is a noteworthy relation—call it coincidence, if you will—between the character of the country rock and the richness of the quartz veins which it encloses. All along the series of extensive and productive mines, stretching for 20 miles from the Cosumnes to the Mokelumne river, the country rock is a black slate. The vein-filling is also of the same character. The lodes rarely occur in the diabase, but rather in the black slate at or near its contact with the "greenstone" dykes. A piece of ore brought by me from the Wildman Mine at Sutter creek, Amador county, is quite typical of the low-grade ores of the mother-lode region, and exhibits the ribbon structures and graphitic slate casing, both thoroughly characteristic of the productive veins. That "the lodes in the slate are almost entirely composed of quartz, while in the serpentine there is a considerable amount of gangue invariably included in the vein," is a statement which I cannot corroborate. If the lodes of the main gold belt of California have one feature more marked than another, it is the inclusion of country rock and the ribbon structure so produced. In this respect, the lodes occurring in slate are certainly no exception. May I mention a personal experience? A mine whose lode was massive white quartz, occurring at the contact of an augite schist and a diabase, was found poor indeed; but another lode, only a thousand feet further east, occurring in a black slate, and carrying quartz ribboned with inclusions of country rock, was found to be far more gold-bearing than its neighbour. This one experience was

---

* Gangstudien 1, page 209; Von Cotta, pp. 58-59.
Journal of the Royal Institute of Cornwall, No. XIII
"Observations on the Rich Parts of the Lodes of Cornwall."
Proceedings Institute of Mechanical Engineers, 1873, Penzance meeting.
"Origin and Mode of Occurrences of Gold Bearing Veins." Journal of the Royal Society of New South Wales. No. XXXI, 1887.

* Transactions A. M. Institute Mining Engineers, Vol. XVIII, p. 443.
† Tenth Annual Report California State Mining Bureau.
‡ Scientific Proceedings Royal Dublin Society, 1879, p. 219.

confirmed by observations made elsewhere in the same region since that time, and also by the experience of the oldest mine managers with whom I discussed the matter. All veins in black slate are not richly gold-bearing, but most of the rich lodes are in black slate, and an unnumbered quantity of veins in greenstone and schist have been found worthless. That is as near to a generalisation as I dare venture. The Thames mining district, whose lode structure I have briefly described, has a geological connection with the hot lake region of Rotorua, about 45 miles distant. At Rotorua, at one time famous for its lovely pink and white terraces, there are numerous thermal springs, geysers, and fumaroles. The surrounding plain is largely covered with fragmentary andesite and rhyolite. This material is for the most part loose and unconsolidated. Near the edges of the fumaroles, however, it has become cemented, and then very much resembles the country rock of the mines of the Thames. Further, the rims of the fumaroles show products of decomposition identical in character with those observed near the lodes, and which have been referred to as the soft and granular material, often called "tufaceous sandstone" by the miners. While at the Thames the andesites are usually brecciated, it must be added that solid andesite rocks also occur occasionally. The latter often gradate into the former, and appear to have penetrated through them, re-cementing them. This region very forcibly suggests the relationship observed elsewhere between young eruptive rocks, thermal springs and lode formations. The accurate study of this association of geological phenomena would do much to give us definite ideas on the subject of the genesis of ore deposits. Turning to the note which I offered on the subject of the Ballarat "Indicator," I would wish to refer to a description, which I only saw a few days ago, of a very similar occurrence in a neighbouring mining district. In the Quarterly Report of the Victorian Mining Department for December 31, 1888, there is a description by Mr. E. J. Dunn, a well-known colonial geologist, of the Champion Reef at Wedderburn. Wedderburn is close to Dunolly, and nearly 50 miles distant from Ballarat. This is a part of Victoria celebrated for the large nuggets which it yielded in the early days. Mr. Dunn gives a vertical section which has many features resembling the sketch made by me in the New Normanby mine. He says that "it shows the influence of the band of country rock called the "Indicator" on the productiveness in gold of the intersecting quartz "leaders." In parenthesis, I would say that the term "leader" as used here is unfortunate. A "leader" is a quartz vein or seam which "leads" a miner; in this instance, the "Indicator" itself is the leader," and the intersecting quartz veins can be better called "cross-veins." He continues:—"The country rock is of yellow and gray, soft sandstone and clayey beds, having a strike N. 5° W. and a dip 60° to 80° E. One of the beds of rock is of dark gray to black colour, and from five to seven inches wide, made up of thinly laminated unctuous clay. This is known to miners as the "Indicator." At intervals of a few inches to several feet apart are flat leaders of quartz, from a quarter of an inch to one foot thick. These dip to the N.W. at angles ranging from 20° to 30°. Where they intersect the 'Indicator,' the latter is generally displaced a few inches. At or near the intersections the quartz leaders become auriferous, and often richly so, the gold occurring in coarse nuggety pieces, and frequently of crystalline character. The leaders are barren except at the intersections with the 'Indicator,' or of nearly vertical thin quartz veins, called 'droppers' by the miners. A portion of the 'Indicator,' on assay, gave only a trace of gold, unweighable, but this result is, nevertheless, regarded as important, showing the actual presence of gold, in however small quantity, in a particular band of the country rock, in contiguity with which bands the quartz veins are found richly auriferous." I must ask pardon for so long a quotation, which is only permissible because the geologist quoted is one of the most accurate of observers, and because it very completely confirms the note which appears as a part of my paper. To that note I may make the following additions:—Though at a level where I obtained my sketch the "Indicator" is only slightly dislocated by the cross-veins of quartz, yet in other parts of the New Normanby Mine there are floors or slides which throw it for from 12 to 25 feet. These faults have a strike and dip similar to that of the cross-veins. While the latter at the 700 and 800 feet levels have a flat dip to the east, yet nearer the surface they incline west. The "main lode" of the mine, a fissure-vein cutting across the bedding of the country rock, is less profitable to explo't at the lower levels than the line of the "Indicator" where intersected by cross-veins, but at surface the 50 feet of country separating the "main lode" from the "Indicator" was so richly gold-bearing as to have been all removed by open-cuts. The association of organic matter with ore deposits has been often pointed out. In this instance, the observations above recorded may be summarised by saying that both in the mines of Ballarat East and in those of Wedderburn, places nearly 50 miles apart, gold is found to occur in notable quantities wherever cross-veins of quartz intersect a thin seam of graphitic clay or slate which is conformable with and forms part of the bedded sedimentary rocks.

REPORTS FROM THE MINES.

COLONIAL, INDIAN, AND FOREIGN.

ANGLO-MEXICAN.—The manager writing from the mine under date April 24, reports as follows:—New Main tunnel. Work was resumed on this tunnel during the past week, after having been stopped during the week preceding for the purpose of starting from its face another ore chute to the Guadalupe level above. This chute has now been started, and work has again been resumed in the tunnel as already stated. The object of the new chute is to increase our facilities for extracting ore from the mine and enable us to do the work with more ease and economy. You will note that for the week under report the tunnel was advanced 10 feet, making a total distance run to date of 1464 feet.— Face of Guadalupe. This tunnel was advanced 14 feet during the past week, giving it a total length to date of 2473 feet. The face of this tunnel continues to give promising assays, but there are no immediate indications of an ore body coming in as yet.— Upraise No. 14 drift south from air winze. This upraise was advanced 11 feet during the week under review, making a total height to date of 41 feet. The vein in the face of the upraise is of more than average width, and the value of the ore has improved somewhat since last week, assaying about $40 per ton in gold.— Drift north from upraise No. 11. This drift was advanced 14 feet during the week under report, making a total to date of 19 feet. The vein in the face of this drift is about 4 feet in width, and looks about the same as last week.—Winze No. 3. This winze was advanced 8 feet during the past week, having attained a total depth of 43 feet. The vein in this winze has improved somewhat since last week, and now begins to carry some gold, as you will note by reference to the assay list.—Winzes Nos. 9 and 10. Both these winzes look about the same as last week, No. 10, however, having run into a little high-grade ore, the continuity of which will have to be proved by further work.—Stopes. The stopes continue to look splendidly, the vein being wide and carrying good ore in large quantities. It is needless to say that the stopes easily supply us with more than sufficient ore to supply the mill.

AUSTRALASIAN.—Mine report of Mr. John James, dated April 11; On Saturday, March 30, Messrs. Green and Tebbutt finished the erection of the winding plant, and it is giving every satisfaction. The seven weeks' accumulation of water in the shaft was baled out in three shifts of eight hours each. When the water was out I put a No. 4 Blake's pump in the shaft at the water lodge to supply water for the boiler. The pump is working well. Three hours in the 24 will give us a supply for all purposes. The contractors, Bishop and party, resumed sinking the shaft on the 5th inst., and have sunk an additional 10 feet, total 132 feet, and timbered 18 feet, total timbered 122 feet. The country rock at present passed through is limestone laying in floors, which breaks well. The water is about 100 gallons per hour. Now the machinery is working good progress should be made in sinking.

ALAMILLOS.—Mine report, dated May 22: In the 85 fathom level driving west of Taylor's engine shaft the lode is small and unproductive. The lode in the 160 fathom level west of the same shaft is very wide, and yields stones of lead ore, and is valued at ½ ton per fathom. The 100 east of Judd's engine shaft is letting out water which is an indication of its getting near the crosscourse.

BAYLEY'S REWARD CLAIM.—Ore and gold return for fortnight ended March 30: Estimated amount of stone at grass, 4624 tons; stone raised 158 tons; stone treated, 178 tons; gold won, 365 ounces.—Mining report, dated April 1. Sylvester shaft. During the week the timbering of the shaft has been completed, and the cage road brought down from the upper level. Will now commence to open out the chamber at the 380 feet level, leaving 10 feet for the well. 220 feet winze at the 220 has been sunk 5 feet, reef being full width of working, and of the most favourable character.—Gordon shaft. South stopes of 50 feet level yielding stone of average grade.—North stope. North stope continues to return stone of average value.—No. 1 intermediate stope. No particular change to report, lode being large and showing gold. Cockshott shaft has been sunk 4 feet, total 106 feet from brace, is apparently in one of the breaks in the reef, the chief portion being slate material, containing a little water, so that I do not anticipate being able to sink much deeper.—Air shaft North drive driven 4 feet, full length being 74 feet from shaft. Reef is 3 feet wide, of the most promising material, at times exposing fine gold.—Everard shaft. Drive from the end of big blow where the lode was faulted is at present 41 feet, being driven 5 feet for the week. Reef of the most promising character, but gradually making smaller as we near Ford's shaft.—Mining report, dated April 8. Sylvester shaft, During the week have been engaged cutting chamber at the 380 feet level, and making good progress.—220 feet level. Winze at the 220 feet level sunk 3 feet, total 31 feet from brace. Lode still strong and of most favourable appearance.—Gordon shaft. South stope 50 feet level returning fair average grade stone, lode being from 2 to 4 feet wide, gold at times being seen.—North stope. North stope shows no particular change; reef about 5 feet wide, exposing gold. No. 1 intermediate stope continues to yield fair value stone, lode ranging from 4 to 6 feet wide. Cockshott shaft sunk 3 feet, total 109. Will during the week open out and drive north 50 feet below the upper level. A little water in the shaft, but not increasing to any great extent.—Air shaft. North drive has been driven 3 feet, full length being 77 feet. Reef 3 feet wide, which is fair battery stone.—Everard shaft. Drive from the end of the big blow driven 7 feet, total 48 feet, lode as we continue north making very much smaller.—(Signed) W. H. Matthews.

BAYLEY'S REWARD No. 1 SOUTH.—Mining report dated April 1: Main shaft. South drive at the 170 feet level is at present 13 feet from the shaft. Reef continues the same as last reported. Will now take down the eastern portion, carrying the full width of the lode, which possibly may not be so hard, and enable us to make more rapid progress.—90 feet level. Winze from 90 feet level sunk 2 feet, total 32 feet. At this point struck water, the ground not being drained, consequently have suspended sinking until the bottom drive is underneath, and the ground drained. In the meantime will open out a short intermediate drive. During the week have seen some very nice gold.—Stopes. The stopes south of the main shaft continue to yield stone of very good value, at times exposing some very nice gold, both coarse and fine.—North drive. Have also resumed work in the north drive. Reef ranging in size from 18 inches to 2 feet 6 inches wide, and during the week has shown very fair gold.—Machinery. The machinery working well, but of course there is loss of time chiefly in keeping the water clear of slimes.—Tanks. Have been making and fixing tanks and other surface appliances necessary for the working of the mine.—Mining report dated Coolgardie, April 8: Main shaft, 170 feet level. During the week have been engaged taking out the eastern portion of the lode previously left standing; have now reached the eastern wall, but shows no particular change.—90 feet level, winze. Raising stone for the battery of very fair grade, at times some very nice gold being seen. At present only working on the western side, consequently do not know the size of the lode at this point.—Stopes. Stopes above the south drive yielding stone of average value, gold being seen in raising.—North drive. North drive is at present 53 feet from the chamber, being 18 inches wide showing gold.—Condenser. The condenser is a great saver in the consumption of water, still it is not doing so well as I would wish. We are now making further additions to it, which I think will be a further improvement, and enable the engine to be worked with less expense.—(Signed) W. H. Matthews.

BRILLIANT BLOCK.—Mine manager's report for the fortnight ending April 3: Underlie shaft sunk 9 feet, total below 7 level 40 feet; reef, 4½ feet; 18 to 20 dwts. 7 level west driven 14 feet. We are driving on footwall reef 15 inches of 15 dwts. stone. 7 level east extended 17 feet, total length 117 feet from shaft; reef 3 feet; 17 dwts. In stopes 1 to 3 feet, same quality. 6 level west extended 6 feet, total length 307 feet; reef in face 20 inches; 7 or 8 dwts. Stopes over and near shaft reef 1 to 4 feet; 12 dwts. 6 level east driven 15 feet, total length 339 feet; reef 4 feet; 15 to 17 dwts. Stope 6 inches to 5 feet; 10 to 20 dwts. 5 level west No. 2 winze deepened 22 feet, total depth 93 feet; reef in bottom 2½ feet; 8 to 10 dwts. 5 level east No. 2 winze deepened 13 feet, and holed through to No. 6 level. Stoping on main reef 20 inches thick 20 to 30 dwts.—Flat reef. Reef 6 inches to 2 feet 1 ounce stone. 4 level west reef 2½ feet; 12 to 16 dwts. stone.

BRITISH BROKEN HILL PROPRIETARY.—Mining manager's report for the week ending April 17:—Blackwood (No. 1 shaft, 240 feet level. East crosscut extended 10 feet, total length 30 feet, still in country.—300 feet level. North-east driven 13 feet, total distance 192 feet, water still flowing from face which is probably an indication that we are approaching the eastern vein. West crosscut advanced 7 feet, making total length 72½ feet. East crosscut lengthened only 3 feet, as ground is extremely hard, total length 31 feet.—100 feet level. Good progress made with the uprise from far north stopes which is now just above intermediate (75 feet) level, and still showing splendid lead ore.—Marsh (No. 6) shaft, 2nd level. Have been fossicking southwards on lode down winze during early part of week, and have also started a winze here in order to test lode under foot which was sunk 2 feet through carbonate ore. We broke 6 tons, assaying 28 per cent. and 56 ounces, and 15 tons, averaging 25 per cent. lead and 45 ounces silver per ton. West crosscut off north drive extended 6 feet, making total distance 50 feet, and stopped. East crosscut off north drive lengthened 9 feet, total 46 feet, face in country, wich is iron stained in places.—Retallick's workings. The tributors are making fair progress on lode around winze in north drive from Retallick's winze. They mined 19½ tons, assaying 41 per cent. lead and 19 ounces silver per ton. The week's assays of carbonate ore vary from 18 per cent, to 58 per cent. lead, and 2·9 to 138·5 ounces silver per ton.

CRAVEN'S CALEDONIA.—The following fortnightly report has been received from the mine, dated Charters Towers, April 12:—The No. 11 level has been extended a further 10 feet, making a total of 35 inches from the fault. The reef is about 8 inches thick in the face at present, and in the stope over it the reef is about 9 inches thick. In the underhand stope from No. 9 level the reef will average about 9 feet. In the stopes over No. 9 level the reef is about 9 inches. The drive on the fault in No. 8 level has been extended a further 20 feet, making a total of 214 feet from Craven's reef. At this distance we holed through into the stopes of our hanging-wall reef, and it is showing 10 inches of splendid mineral stone. The haulage of quartz is 68 tons for the fortnight, making a total of 73 tons on the surface.—(Signed) G. Cabessi.

CASSIDY HILL.—Mine report received May 27: No. 4 reef. Have driven north-east on this reef a distance of 16 feet, total from No. 2 shaft 141 feet. The reef is 10 inches thick, and shows coarse gold in breaking.

COLOMBIAN HYDRAULIC.—T. P. Sharman, April 7:—Report on run No. 201, La Mesa Mine. After a run of 63 days, during which time we were washing in the La Mesa Mine 1298 hours, we have cleaned up a total of $7263·10 or about £1453 at a cost of about £990 giving a profit of about £463, of which profit about £318 is from the drifting. This includes the gold of run No. 200. During the first seven weeks of this run we had no sound bank to work on, but after that we then commenced on the high untouched bank, and in the last 10 days opened a splendid face of soft gravel from 50 to 130 feet high, resembling in every way the banks on this north side, which have always given a fair result when they have been of any height. We shall now have a couple of runs on this gravel, and I hope it will be found to justify opening in this place. Owing to the revolution we have not made the new south side opening yet.

COROMANDEL.—Superintendent's report for the fortnight ending May 4: Prospect shaft. Crosscut east from 500 feet level south has been driven a further 35 feet, making its total length 85 feet from level. The rock is extremely hard, but not of an unpromising character. 500 feet level north on new shoot driven for the fortnight 40 feet; distance from crosscut 90 feet. The present end is in the slide, which is here 6 feet thick, and has cut out the lode completely. The south end on this shoot, after a further drivage of 20 feet, encountered the dyke, and was suspended, at a distance of 62 feet from crosscut. The machine was then started to rise in the back 12 feet south of crosscut. Risen to date 5 feet. Lode 4 feet 6 inches wide, assaying 1 ounce 11 dwts. 6 grains per ton. Rise back 440 west of dyke risen by hand-labour 4 feet 6 inches. Lode still increasing in size, being now 3 feet wide, and worth 6 dwts. of gold per ton.—No. 2 rise back 440. The 320 end south from top of this rise has been driven a total distance of 32 feet 6 inches and suspended. The rise was then resumed, and has been carried up 8 feet above back of the level. Lode in south end and in present rise is 3 feet wide, and assays 5 dwts. of gold per ton. No. 3 rise back of 443 risen 14 feet only, some days having been spent in driving round on the fold. Lode 5 feet wide, and worth by assay 6 dwts. 6 grains of gold per ton. 200 feet level north-east driven 38 feet, total 250 feet from shaft. End is still in dyke, but this is becoming finer in texture, and we expect to be through in a few days. 200 feet level north on lode driven by hand 4 feet 3 inches, total 13 feet 3 inches. Lode 6 inches wide, and assays 4 ounces 8 dwts. 18 grains per ton.—Trial shaft on new west lode. After great difficulties with the water, we have succeeded in deepening this shaft to 100 feet, and a drift southward at this level has been started to explore beneath the run of the old workings seen at surface.

CONSORT CONSOLIDATED.—In the neighbourhood of this property, which is situated in the Barberton district of the Transvaal, there has been great activity lately, due to the discovery by the Consort company of what appears to be an extremely valuable reef. All the claims in the vicinity have now been acquired, and prospecting is going on in the hope that this reef on its extension, or on its dip, may be discovered. The Consort Consolidated Mines took over the property of the New Consort Company, paying 50,000 shares for the whole of the claims, 40-stamp battery, completed water-race, and the usual houses and surface plant. The New Consort Company did good service for the Barberton district in proving this mine at a time when it was thought that there was only one payable mine, and that the Sheba, in that portion of the Transvaal. As the New Consort Company had to start with only £12,500 of working capital, it does great credit, we think, to that company's management that, notwithstanding the fact that the battery had to be erected and the mine opened up after having been much hacked about, they succeeded last year in crushing over 360 tons of rock, which milled an average of 9·23 dwts. of gold per ton. That, however, was obtained from the north reef, which was also considered the true Consort reef, and, indeed, the only payable auriferous body within the boundaries of the mine. The new reef to which we have referred was struck to the south of the large quartzite bar which marks the strike of the reef in that district, and it was found to be from 6 to 7 feet wide, averaging by assay over 12 ounces to the ton. The operations of the New Consort Company were then directed to proving that the new strike was not a mere patch or "blow," and the lode was opened up for about 30 feet. The company then, having apparently got about as valuable a mining asset as any company in the Transvaal, acquired all the neighbouring properties, until its claim-holding was 73 claims in all, and from subsequent developments it would appear that it might have been advisable to considerably extend the acquisition of the neighbouring ground. However, at one point within the boundaries of the mine, and about 800 yards distant, what appears to be the same reef has also been opened up. At this stage the Consort Consolidated Mines came upon the scene. The latter company was formed by the Johannesburg Consolidated Investment Company (Limited), and they appear to have made an excellent bargain in the terms upon which they obtained the property, as they acquire the whole of the mine and everything connected with it for 30,000 shares, as above stated. Now, the actual cost, we believe, of the plant on the ground and the money spent in connection with the water-rights, dam, &c., is not far short of the par value of the purchase consideration. The new company has a working capital of £25,000 in cash, added to which there are 25,000 shares unissued, the total capital being £100,000. Crushing will shortly commence, as, with such a large body of reef, very little development will be needed to supply the 40 stamps; and, if the result be as satisfactory as appearances would indicate it should be, there will be ample additional capital available, by the sale of the reserve shares for the erection of a very much larger crushing plant, without tampering with the capital of the company upon which dividends have to be paid. Active dealings in this company's stock have lately taken place, and it is anticipated that the shares will be "settled" at the end of June or the middle of July "Account." The shares at present stand at about 2½.

GLENCAIRN.—Before the end of the year the Glencairn should be one of the model mines of the Rand, not only from a purely engineering point of view, but also with regard to economical consideration generally. The mill will shortly be enlarged to a power of 100 stamps, producing a return of something approaching 7000 ounces per month, and a profit very much above the £6000 or £7000 that are now being yielded. Hitherto the expenses have been very heavy on account of the new work that has been considered necessary by Mr. Pope, and by reason of the labour involved in placing the mine upon a respectable footing. Development has had to be forced as much as possible, and since the charges of this have been placed against the monthly profit and loss account, the monthly profits have had to bear a heavy burden. It will still be necessary to push the development somewhat, since the ore in sight amounts to only about 50,000 tons—a tolerably good quantity, nevertheless, when one remembers the condition of things which Mr. Pope had to face upon his taking up the management. The mill will put through 12,000 tons or so per month, but the mine has this advantage—viz., that the ground lies fairly unbroken by either faults or dykes, and the work of opening up will be more or less a straightforward business. Nine drills are now being kept in development, and within a week or so additions will be made to the compressor plant, and eventually 14 machines will be going. The drills are now under order. The extra 30 stamps which are to be erected will be kept pretty well going by the ore produced from the drives alone, so that the quantity of reserves should rapidly get ahead of the 100 stamp mill, in fact, the ore opened up per month should be nearly double that crushed. The concrete foundations are ready for these stamps, and the piles are in place. A new battery engine is to be provided, and the present one used for an electrical pumping plant to send water up from Knight's dam. The milling average now is rather more than 8 dwts. over the plates, and not including concentrates. The cyanide operation produces another 5½ to 6 dwts. of

800 fine gold, at a cost of 5s. or so. Later on it is proposed to alter the rock house by placing a travelling belt there for picking purposes, and this should make a material difference in the grade of the ore. The cyanide plant will be enlarged as soon as the increased battery power has been provided, and system of double treatment of the sands will be arranged upon a plan similar to that lately adopted by the May Consolidated. The first treatment vats are built upon very high foundations—high enough, in fact, to allow of a second row being built upon the ground with their upper edges near and upon a line with the bottom line of the first vats; the sands are then simply turned from one series into the other, which lie immediately below. The cost of the cyaniding will be reduced later to about 4s. per ton instead of 5s. In order to effect the enlargement mentioned, the vats now in use will be removed from their present position to the new place near the mill. The pulp, which is pumped up to the proper level by a pair of Begbie and Holleman's plunger arrangements, will, first of all, be passed through spitzluten, in order to separate the heavy stuff and concentrates, as is done at the Crown Reef and Metropolitan Mines. With regard to the mine itself, it may be mentioned that the main incline shaft is now down 26 feet below the sixth level, or about 716 feet altogether upon the incline. The third level is nearly to the boundary; on the fourth level 300 feet more have to be driven westwards, and about 350 feet eastwards before the limit is reached; on the fifth level east 500 feet have to be driven yet, and 150 feet west. Two stopes are going above the third level upon some ore that was left, but the ore is mainly coming from between the third and fourth levels. The average thickness worked is from 4½ feet to 5 feet. In the fourth level end east the assays give an average of 19 dwts. 16 grains over a thickness of about 6 feet, while westwards an average of 11 dwts. over 3 feet. In the No. 5 level end east the average goes about 18 dwts. over a 6 feet section, and westwards about 19 dwts. 22 grains over a 3 feet section. About 8 feet south of the so-called north reef leader the Main reef has been found, which gives 4½ dwts. in the mill and 3½ in cyaniding. Two stopes are going upon it on the fourth level, and one on the third level west of the incline shaft. It has a thickness of from 2½ to 4 feet, and should, when the working costs have been lowered, prove an important body of rock, particularly when picking is resorted to. It is not improbable that it may be found much richer and thicker in places, and since it lies within easy distance of the north reef working levels, the cost of exploring it should not be excessive.—From the Johannesburg *Star*, of May 4.

GOLD FIELDS OF MYSORE.—Fortnightly report on prospecting operations, dated May 7: West Balaghat block, No. 1 shaft. The 117 feet level north has been driven 4 feet 9 inches, total distance 175 feet. Lode 1 foot 6 inches wide, assaying 5 dwts. 6 grains of gold per ton. The south level has been driven 4 feet 9 inches, total distance 150 feet 3 inches. Quartz 3 feet wide, assaying 1 dwt. 4 grains of gold per ton.—No. 2 shaft. The 100 feet level north has been driven 3 feet 6 inches, total distance 149 feet 11 inches. Lode 2 feet wide, assaying 1 dwt. 4 grains of gold per ton. The driving here was discontinued on the 4th inst., and the coolies put (close to end) to sink to communicate with the 117 feet level south of No. 1 shaft. The difference of level between levels is approximately 30 feet. The south level has been driven 2 feet, total distance 163 feet 9 inches. Lode 1 foot 3 inches wide, assaying 10 dwts. of gold per ton.—No. 3 shaft. This has been sunk 5 feet 3 inches, total depth 169 feet. Lode 2 feet wide, assaying 2 dwts. 8 grains of gold per ton. The 117 feet level north has been driven 3 feet 9 inches, total distance 82 feet 6 inches. Lode 2 feet wide, assaying 3 dwts. 12 grains of gold per ton. The south level has been driven 5 feet 3 inches, total distance 177 feet 6 inches. Lode 1 foot 3 inches wide, assaying 12 dwts. 5 grains of gold per ton.—No. 4 shaft. The 148 feet level north has been driven 3 feet, total distance 70 feet. Lode 1 foot 3 inches wide, assaying 2 dwts. 16 grains of gold per ton. The south level has been driven 3 feet 3 inches, total distance 60 feet. Lode 1 foot 6 inches wide, assaying 7 dwts. 4 grains of gold per ton.—Road block, north shaft. The north level from bottom of shaft has been driven 11 feet 6 inches, total distance 133 feet 9 inches. Lode 1 foot 6 inches wide, assaying 13 dwts. 12 grains of gold per ton. The south level has been driven 9 feet 3 inches, total distance 134 feet 6 inches. Quartz 1 foot wide, assaying 4 dwts. 8 grains of gold per ton.

GOLD FIELDS OF MYSORE.—Mine report for fortnight ending May 6: Oriental lode, south shaft. The 280 feet crosscut east has been driven 16 feet 1 inch, total length 246 feet 6 inches from shaft. It is going forth in a jointy syenite rock which is traversed by calcareous veins, but there are no signs of the lode as yet. The 380 feet end north has been driven 18 feet 6 inches, total length 339 feet 5 inches from shaft. The lode is 3 feet wide, showing 9 inches of milling stone, which is composed of mixed quartz and black rock charged with pyrites, the assay value being 13 dwts. 15 grains per ton. The 380 feet end north has been driven 18 feet 6 inches. Total length 314 feet 7 inches from shaft. The end is now following along a broken division and gives no quartz of value.—Skip-road. Fair progress is being made in removing the ladder-way and fixing all dividings possible for the same previous to stripping the shaft. At the 470 feet level we have six coolies employed in raising the roof of the south level by hand-power so as to admit air pipes for boring machine. This is all we can do here for the present, or until the skip-road is finished, because our present hoisting machine is fully occupied in drawing stuff and water.

KEMPINKOTE.—Superintendent's report for fortnight ending May 6: Garland's shaft has been sunk 7 feet 3 inches, total depth from surface 354 feet 3 inches. There is a branch of the lode in the bottom of the shaft about 1 foot 6 inches wide, assaying 4 dwts. of gold per ton of stuff. We have taken out the 9 inch bucket lift from surface to the 183 feet level, and removed cistern and bearers. The cutting of the bottom plat at the 345 will be completed in a few days. 245 north drive has been driven 25 feet, total distance from main crosscut 210 feet 9 inches. We are carrying 5 feet of the footwall part of the lode, assaying 2 dwts. 14 grains of gold per ton of stuff. 245 No. 1 crosscut west 100 feet from main crosscut has been driven 10 feet 10 inches, total distance from footwall 43 feet 4 inches. About 38 feet from the footwall we met with schist, after passing through about 2 feet of this the drive again entered lode. Lode in the end the full width of the drive, assaying 1 dwt. 14 grains of gold per ton of stuff. 245 south drive has been driven 23 feet, total distance from main crosscut 179 feet. We are carrying about 5 feet of the footwall part of the lode, assaying 1 dwt. 7 grains of gold per ton of stuff.—Henty's shaft. During the past fortnight we have put in 10 feet of bucket road, a set of stays around the lift, &c., and have sunk 4 feet 5 inches, total depth from surface 294 feet 3 inches. The ground in the bottom of shaft is still hard and spare for sinking. 258 south drive has been driven 30 feet 6 inches. Total distance from main crosscut 113 feet 6 inches. The ground in the end is harder and mixed with quartz, showing a trace of gold. 173 north drive has been driven 6 feet 3 inches. Total distance from shaft 83 feet 3 inches. We are carrying 5 feet of the hanging part of the lode, assaying 3 dwts. of gold per ton of stuff.—Prospecting Big Pit, No. 10 trial pit, south-east corner of Big Pit. Drive east 43 feet from surface has been driven 45 feet 6 inches, total distance from shaft 53 feet. About 20 feet east of shaft the drive entered old workings and took a southerly direction. After driving about 12 feet through old workings we met with a lode in the bottom of the drive. The lode in the end is the full height of the drive, and about 2 feet wide, assaying 7 dwts. of gold per ton of stuff.—Madihulli Block. No. 1 trial pit at the bottom of the pit 38 feet from surface, we have driven a crosscut east 16 feet, total distance from shaft 16 feet. About 2 feet east of shaft we met with a lode which was about 8 feet wide, and rather poor. Our crosscut entered a decomposed schist, which lasted about 3 feet, when we again met with about 1 foot 6 inches of lode; this, too, was poor. Our drive again entered a soft schist, which continues. Owing to the increase of water caused by the recent heavy rain, and the shaft becoming dangerous, we were obliged to suspend operations.

MOSMAN GOLD MINES.—Mine manager's report for fortnight ending April 13: North Australian Mine (crushing cabled April 22, 93 tons, 212 ounces). Byerley level stopes 6 inches to 9 inches (in one, north stope, 1 foot to 2½ feet), worth (say) 1½ ounce. South reef 8 to 10 inches, worth (say) 1½ ounce. Underhand stope. Reef 4 inches, good quality.—Intermediate level. Winze being sunk on 6 inch stone, worth (say) 3 ounces per ton.—Peabody Mine. Underlie shaft sunk 128 feet from surface. Work will be started again on wages until we break through to the old vertical shaft.—Wyndham Mine (crushing cabled April 22, 69 tons 379 ounces). Underlie shaft deepened 17 feet, total below 13 level 129 feet. Reef south end of shaft 18 inches. 13 level north winze sunk 12 feet. There is a leader 2 inches thick being carried down. 8 south level reef 8 inches thick, fair quality.—9 level south. Stopes, reef 4 to 16 inches, worth (say) 4½ ounces per ton.

MILLS' DAY DAWN UNITED.—Mine manager's report for the fortnight ending April 5: Underlie shaft sunk 10 feet, total below the 9 level 72 feet. Formation small, with a leader 6 inches of fair quality.—9 level west. Total length 155 feet from shaft. We have cut stone 2 feet thick on the footwall, heavily mineralised.—8 level west, main drive. Am driving a cross to the H. W. reef. Have driven 10 feet. Reef on stopes averages 4½ feet, fair quality.—8 level west, H. W. drive. Total length 51 feet Stopes 1 foot, medium quality. 8 level west crosscut 2 feet, medium quality. 7 level footwall stope 2 feet, fair quality. 6 level west main reef 4 feet, of medium quality. Footwall 1 to 2 feet, heavy mineral stone.—5 level west. Footwall stope 2 feet, good quality.—5 level east. Footwall crosscut No. 2 rise extended 10 feet, total from back of level 27 feet. Shall hole into footwall during present fortnight.

MYSORE WEST AND MYSORE-WYNAAD CONSOLIDATED.—Tank block. The mining manager (Mr. P. Bosworth Smith) reports, by mail, for the month of April, as follows:—South shaft. 450 level south has been driven to a distance of 108 feet 6 inches from crosscut, making a progress of 80 feet for the month. The lode in the end is 2 feet wide, and worth 4 dwts. per ton. The end seems opening out, and the quartz improving. At 60 feet from crosscut to shaft we started a crosscut back east to see if there was not a branch behind the black rock. This was driven for 8 feet, when we cut into the ordinary country rock; accordingly the crosscut was stopped, and we have started rising. 450 level north has been driven 93 feet 6 inches from crosscut to shaft, making a progress of 68 feet 9 inches. The lode is full width of level, but is mixed up with large boulders of black rock, and is making a good deal of water. Quartz assays 7 dwts. per ton. At a point 60 feet from crosscut to shaft we started a rise on a solid band of quartz in loose lode, but this flattened back, so we are crosscutting to get foot-wall to rise upon. 400 north has been driven to a distance of 318 feet 6 inches from shaft, making a progress of 15 feet 9 inches. A short crosscut to west was also driven during the month. There is no improvement to report in this end.—354 level. No. 1 stope south of winze quartz is opening out a little to south; average width 1 foot 6 inches, worth 10 dwts. per ton. No. 2 stope north of winze quartz averages 18 inches to 2 feet, and is worth 10 dwts. per ton. No. 3 stope south of rise, quartz is 2 feet wide, and worth 11 dwts. per ton. No. 4 stope, lode matter and quartz is 4 feet wide, worth 6 dwts. per ton; quartz worth 1 ounce per ton. The mill ran for 550 hours (accident to cam shaft lost us three days), and put through about 350 tons of stuff, 300 of which was estimated to be quartz. From this we got 160 ounces of gold. Pulp leaving boxes assayed for first half-month 7 dwts. per ton, for second half 9 dwts. per ton. Tailings, first half, 2 dwts.; second half-month, 3 dwts. per ton.

MOUNT LYELL.—The London board have received the following reports from the Melbourne board for the week ending April 10: North drive, No. 3 tunnel. The drive has been advanced 6 feet, total 122 feet. The country driven in is a hard silicious rock.—Indicator winze, No. 3 tunnel. The winze is down 96 feet, 3 feet being sunk for the week. There is no change to report.—North drive, No. 4 tunnel. The face has been advanced 7 feet, total 127 feet.—No. 1 rise, 50 feet level, engine shaft, No. 4 tunnel. The rise is up 32 feet, 1 foot being cut for the week. The delay has been caused by the timbering, which has now been completed to 27 feet above the level.—North drive, 100 feet level, engine shaft, No. 4 tunnel. This drive has been advanced 3 feet 6 inches, total 113 feet 6 inches. The ground is breaking a little better.—South drive, No. 2 shaft, No. 4 tunnel. The face has been advanced 2 feet, total 21 feet. The pyrites are still intensely hard.—No. 5 tunnel. The contractors have driven 4 feet 6 inches for the week, total length of tunnel 1003 feet. The band of ironstone has been cut through, and the face is now in schist rock.—Progress report for the week ending April 10: Main line. Ragged creek and lime-tone tramways, ballasting in active progress.—Abt siding. Contractor for bridge over Queen river making good progress. Earthworks completed to 30 chains, and in active progress on remainder.—Through tram. Bridge over Queen river nearly completion; all other works completed.—Haulage line. Earthworks in progress to bank engine site and station yard also well in hand.—High pressure reservoir. Excavation half completed, flaming in position for 25 chains. Brick and sawmill plant running full time; working very satisfactorily.

OTTOS KOPJE DIAMOND.—Extract from first letter received from Mr. Wm. Evans since his arrival at Kimberley, dated May 6:—My first enquiry was as to the condition of the foundations. I am glad to say that they are absolutely sound, and were never in any peril. The timbering which proved faulty was some of the side timbering; those faults have been remedied. My next enquiry was whether any suspicion existed that the machinery would not ultimately do the work expected of it. Mr. Lisle, Mr. Mercer, and Mr. Marshall replied that there was no ground for the suspicion. Mr. Mercer, who appears to be a most competent and experienced engineer, thinks we are now close to the end of the long road of partial failures.

PUNJOM.—The following is the manager's report for March:—Mining. August shaft, 200 feet level. Good progress has again been made in extending the No. 2 crosscut, 38 feet 6 inches having been driven, making its total length 241 feet. The face is still in good looking country, and letting out water freely.—Intermediate 140 feet level. The drive on Phillips' leader has been extended 7 feet 6 inches, and connected with the east crosscut. The east drive to connect with the winze being sunk at date of my last report below the 110 feet level has been extended 9 feet, and the connection made. Stoping will now be commenced there. Two winzes have been commenced in the bottom of this level to open up stoping ground, and should connect with the 200 feet level within the coming month. Depth sunk No. 1 winze 28 feet; No. 2 winze 13 feet 3 inches. The stopes over this level are now giving fairly good ore for the mill, as is also the No. 1 winze. The winze on No. 4 leader at the 110 feet level has connected with the drive put out to meet it, and men are now engaged stoping. The ore so far is poor, but I have reasons for expecting an improvement soon. Depth sunk 35 feet.—110 feet level. The winze we were sinking on the course of the north and south reef at date of my last report has, as before mentioned, connected with the intermediate level.—Upper stopes. These have given a large quantity of low grade ore for the mill. The drives and stopes south of the August shaft continue to yield ore of very fair quality. Total drivage at this point 202 feet. The operations we were carrying on to the west of the big outcrop of quartz, failing to find anything of value. Work there has been discontinued. Distance sunk and driven 41 feet 6 inches.—Mill Gully Tunnel. The south drive on the course of this reef has been extended 11 feet 6 inches, and has been stopped for the present. I hope to resume work at this point again shortly, however. Exceptionally good progress has been made in driving north, the contractor having completed the 100 feet and earned the bonus offered. This point has connected with the little air shaft, and is now well ventilated. We should connect with the deep workings at the Kladi tunnel within the next fortnight, when all ore raised there will be brought to the mill through this tunnel. I need not tell you that this will completely drain the Kladi workings at their lowest level.—Kladi tunnel. This point is receiving a good deal of attention, and good progress is being made, the total distance driven and sunk equalling 226 feet. The reef here continues to give fair grade ore, and looks most promising for improvement. Of course, there are many small drivages which can hardly find a place in this report. Total drivage for the month 754 feet 3 inches. The quantity of ore mined is 954 tons, made up as follows:—Upper stopes, 500 tons; August shaft, 119 tons; south of August shaft, 53 tons 10 cwts.; Mill Gully, 46 tons 10 cwts.; Kladi tunnel, 235 tons.—Milling: This was carried on during 28 days, crushing 1360 tons, yielding 456 ounces 6 dwts.—viz., 960 tons from the mines for 416 ounces 6 dwts., and 400 tons of headings for 40 ounces of smelted gold.—Cyanide works. Thanks to the fine weather we are having good progress is now being made with the erection of this. There is still much to be done, however, but the end of April should see the plant nearly, if not quite, ready for starting.—General. The usual attention is being given to all work coming under this head. We have now two large gangs of coolies road-making, so as to get in our supplies of firewood, &c., before the next monsoon, and a further gang is clearing a track to Bapong, where we have put up the necessary appliances for lime burning to supply the cyanide plant.—Labour. This is fairly plentiful. The health of the camp continues fairly good.

SUTHERLAND REEF.—Extract of letter from Mr. S. Robarts, dated May 2 (manager, *pro tem.*) Sutherland Reef (Limited) Leydsdorp): No driving has been done since last report, as the men have been engaged in stoping at the different levels. We have also been short of miners as we had to discharge one for not doing his work properly, and four others. We are sorry to inform you that the calculations of the value of the ore made by the late Mr. Stephens have proved altogether unreliable. Although we have the reef all the way down, we find, on stoping, that the ground is much disturbed, and, although we have patches of very rich quartz, we meet with an enormous quantity of slate between the walls, which only carries gold in the small quartz stringers interspersed through it. The hopeful feature in the mine, however, consists in this fact that the richest and least-disturbed rock is near the bottom level. I have not the least doubt that further sinking will carry us entirely through the disturbed ground, and as the reef has been strong enough to come through all obstructions to the surface, I feel perfectly confident that there is a large strong orebody below.

TOLIMA.—The directors have received advices by the mail of May 25, from their mines, of which the following is an abstract: Frias estimated March returns (120 tons) silver, valued at 29d. per ounce, £4292 3s. 2d. cost, £3358 16s. 5d.; profit, £933 6s. 9d. The underground agent reports 124 fathoms 5 feet 2 inches of ground expended, of which 97 fathoms 5 feet 2 inches were productive, leaving 27 fathoms of unproductive ground. Under date of April 17 the superintendent writes: With regard to the 130 fathom east end from the 120 fathom east winze No. 2, at the present date the lode at this point yields over 2 tons per fathom of a good class mineral. The 110 fathom east and west ends on the north branch from the crosscut continue in good mineral, more especially in the west end. The mineral is strong in the bottom of the level, and offers good prospects for further sinking. Taken as a whole, the stopes are improving slightly in yield at the date of writing. He adds that he hopes during April to complete his arrangements for driving east and west at the 150 fathom level from the prospecting winze, and also to make further progress in arranging to sink the engine shaft to the 150 fathom level.—Engine shaft. The tip plat at the 140 fathom level is finished, and the skip road is brought down to the 110 fathom level, and for current month we shall endeavour to make all necessary preparations for the further sinking of the engine shaft. 140 fathom west end, north branch, was driven 7·8 feet by two men at $78 per fathom, and the lode remains tight and poor. 140 fathom east end was driven 17·7 feet by two men at $75 per fathom, thus being 261 feet as total east of the west winze; and the lode remains poor, but yet fairly promising. 140 fathom east end, north branch, was driven 2·7 feet by two men at $85 per fathom, and is suspended. 140 fathom east back stope was stoped 24 feet on company account, and yielded 2 tons of mineral per fathom.—140 fathom east back stope No. 1 was stoped 60 feet by 4 men at $24 per fathom, and yielded 2 tons of mineral per fathom.—130 fathom west end was driven 26 feet by 2 men at $35 per fathom, thus being 446·7 feet as total west of the west winze, and the lode is much easier to work, but yet poor.—130 fathom west back stope No. 1 was stoped 47 feet by 2 men at $25 per fathom and yielded 10 cwts. of mineral per fathom. 130 fathom west back stope No. 2 was stoped 59·5 feet by 4 men at $32 per fathom, and yielded 2½ tons of mineral per fathom. 130 fathom east back stope No. 1 was stoped 42 feet by 4 men at $35 per fathom, and yielded 3 tons of mineral per fathom. 130 fathom east back stope No. 2 was stoped 21·7 feet by 4 men at $30 per fathom, and yielded 1½ ton of mineral per fathom. 130 fathom east crosscut north was driven 12·3 feet by 2 men at $100 per fathom, thus being 53 feet as total length, and is without change to note. 120 fathom west back stope No. 1 was stoped 6 feet on company account, and yielded 2 tons of mineral per fathom. 120 fathom west back stope No. 3 was stoped 24 feet by 4 men at $28 per fathom, and yielded 10 cwts. of mineral per fathom. 120 fathom east winze No. 2 was sunk 2·5 feet at $150 per fathom, thus being 60 feet as total depth below the 120 fathom level, and the lode yielded 1 ton of mineral per fathom. Owing to an increase of water it is for the time being suspended until we can fix an air-winch at the 120 fathom level for the drawing of the water and stuff. 130 fathom east end from the above winze was driven 21 feet by 4 men at $80 per fathom, and the lode yielded 1½ ton of rather low grade mineral per fathom; and the forebreast is now much improved in yield of quantity and quality of the ore. 120 fathom east back stope No. 1 was stoped 18 feet by 2 men at $35 per fathom, and yielded 1 ton of mineral per fathom. 120 fathom east back stope No. 2 was stoped 28·4 feet by 2 men at $25 per fathom, and yielded 1 ton of mineral per fathom. 110 fathom east end was driven 7·6 feet by two men at $70 per fathom, thus being 886·3 feet as total east of the engine shaft, and is without change to note. 110 fathom east bottom stope was stoped 31·4 feet by two men at $23 per fathom, and yielded 1 ton of mineral per fathom. 110 fathom east end north branch was driven 12 feet by two men at $75 per fathom, and yielded 15 cwts. of mineral per fathom. 110 fathom west end north branch was driven 4·8 feet by two men at $75 per fathom, and yielded 1 ton of mineral per fathom. The above ends were started east and west of the 110 west crosscut. 90 fathom east end was driven 24·8 feet by two men at $55 per fathom, thus being 1059·3 feet as total east of the engine shaft, and the lode yet remains poor. 90 fathom east bottom stope was stoped 52·5 feet by two men at $30 per fathom, and yielded 10 cwts. of mineral per fathom. 90 fathom east back stope No. 1 was stoped 79·4 feet by four men at $20 per fathom, and yielded 1 ton of mineral per fathom. 80 fathom east stope was stoped 48 feet by two men at $26 per fathom, and yielded 1 ton of mineral per fathom. Shallow adit was driven 18 feet by four men and a boring machine at $80 per fathom, thus being 245·7 feet as total west of the crosscut, and the lode is better defined, but yet poor. West end from new crosscut was driven 11·05 feet by two men at $60 per fathom, and the lode is unchanged.—Real de Frias. 35 fathom west end was driven 20 feet by four men at $45 per fathom, and the lode remains poor. It is thought advisable to suspend this, and drive upon the north part of the lode that was left about 18 feet west of the shaft. 35 fathom east end was driven 17·6 feet by four men and a boring machine at $68 per fathom, and the lode is yet poor.

TRANSVAAL GOLD EXPLORATION AND LAND.—Extracted from the general manager's advices, dated May 2: Mining. Theta. Stripping operations made very good progress. Owing to these operations work in the underground drives is at present somewhat restricted.—Chi. The development here was progressing satisfactorily. Work at the other mines was proceeding steadily with no new feature to report.—Prospecting. At Phi north the deposit was being further traced and mined.

VICTORY (CHARTERS TOWERS).—Report dated Sydney, 22nd April: Sinking No. 3 shaft in three compartments, two 4 feet by 3 feet 6 inches, and one 4 feet by 3 feet; rock-drills being used. On the 3rd April commenced sinking the shaft, and on the 13th it was down 27 feet. From that date the progress will not be so rapid as the country will be harder. Have purchased a second-hand six horse-power engine, with about 500 feet steel-wire rope, which is capable of doing all the necessary work till the shaft is bottomed. No. 1 shaft reef 3 to 15 inches, quality improving. Raised 65 tons. No. 2 shaft, rising and stoping over No. 1a level on 12 inches reef, showing some very fair stone. Raised 70 tons.